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A REVIEW OF THE GENUS SCAPHINOTUS, SUBGENUS SCAPHINOTUS DEJEAN (COLEOPTERA- CARABIDAE)

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There has been great need for a restudy of this group of beetles, for some time, for though Roeschke completely monographed the tribe to which they belong in 1907,¹ the work was written in German and published in Hungary, therefore not readily accessible to most of our workers. Besides much more material has been accumulated since this work was published, necessitating a changed viewpoint with regard to certain of the species, also several new species discovered as well as much new information gathered, rendering that splendid work somewhat obsolete. I have, therefore, felt that the time was ripe for the publication in English of a work which would be more up to date.

The material that has served as the basis for this work has been my own collection which has been built up over a period of many years and which contains the Charles Leng Collection as well as many specimens secured from early collectors. I have also used freely the general collection of the California Academy of Sciences and been aided by the following persons: H. P. Löding, F. H. Parker, Owen Bryant, R. T. Kellogg, M. A. Cazier and E. S. Ross who have either generously supplied me with specimens or placed their collections at

¹ Monograph d. Carab. tribus Cychrini, by Hans Roeschke, Ann. Mus. Nat. Hung., V, pp. 99-277, pt., 1907.

my service. I have also examined critically all the types that are in this country as well as a portion of those which are abroad. I am, therefore, under obligations to many institutions and many friends, for without their aid, I could not have properly done the work. The drawings have been made by Mrs. Frieda Abernathy.

Scaphinotus was established by Dejean² in 1826, with *Cychnus elevatus* Fab. as its only species. Since that time numerous other forms have been described by various authors, some of which have remained in our catalogues as good species while others have been relegated to subspecific rank or even to synonymy. At first *Scaphinotus* was considered by most American authors, Le Conte and George Horn in particular, as merely a subgenus of the Old World genus *Cychnus*, but in 1920, was again elevated to generic rank by Leng in his catalogue. Roeschke in 1907, had amplified it to include most of the North American Cychnini, treating *Scaphinotus* in its restricted sense as a subgenus of this. I am more or less in agreement with Roeschke in believing that most of our American species belong in one large genus, *Scaphinotus*, and that this large polymorphic genus is made up of a number of somewhat divergent subgenera, *Scaphinotus sensu stricto*, being one of these. Only by so considering them can one properly evaluate them and show their true relationships, for their differences or divergent features are small in comparison with their points of resemblance. Classification is primarily concerned with stressing relationships, not divergencies.

Scaphinotus as considered in this paper, in its restricted sense, is a subgenus of the genus *Scaphinotus*. As such it is restricted to the territory east of the Rocky Mountains but in the Southwest extends into southwestern Colorado, New Mexico and Arizona, and along the Sierra Madre Mountains at least as far south as the State of Durango in Mexico. In the more eastern parts of its range, the species are generally to be found at lower elevations while in the Southwest they are almost entirely confined to the mountains, generally along the streams or scattered over the damper areas near the summits.

The subgenus as limited is characterized in particular by having the head elongate, infrequently punctured, genae simple, not dilated and without a tooth or an incisure in front of eyes; clypeus without lateral grooves; labrum deeply bilobed, with base of emargination with four setae and inner margin entirely confined to it, not invad-

² Species general des Coleoptera, by le Comte Dejean, II; p. 17, 1826.

ing the clypeus; labial palpi with more than two setae; antennae long and with the first three or four segments glabrous; prothorax large with sides of pronotum wide, wing like and more or less reflexed and the margin with or without a seta near the middle; the prosternal process inflexed at apex; the proepisternum and epimeron distinctly separated by a groove; the elytra with fourteen more or less distinct striae; the epipleura as a rule thickened and coarsely punctured and the epipleural groove terminating in an expansion before the apex; the middle coxae with marginal seta and the hind coxal plate generally with one or two posteriorly placed setae; the third ventral segment with setiferous punctures; and the upper side of tarsi with a few short erect hairs and the front tarsi in males more or less dilated, generally widely, and papillose beneath.

The species are among the most attractive of our Carabidae, generally somewhat metallic, lilac or cupreous in color and readily recognized by the wide and often greatly reflexed sides of the pronotum. In some species there is a fair degree of constancy but in most, particularly the more western, there is a great amount of individual variation as to size, sculpturing and particularly the breadth and degree of elevation of the wings or sides of the pronotum. The more eastern species are limited in number, have a wide range but break up to a certain degree into more or less well marked races or subspecies, each of which is confined to a definite territory. In the Southwest, particularly in New Mexico and Arizona where the mountains are more or less isolated from one another, the species which are restricted to them are more or less limited in their distribution, sometimes confined to a single mountainous area. Roeschke considered the presence or absence of certain setae as of specific importance. That may be so as regards certain species but large numbers of specimens have shown that certain of these setae as those near the middle of the side margin of the pronotum vary greatly, therefore are of less diagnostic value than was at first thought. The degree of union of the ventral sclerites at the sides, a character used by Roeschke, I am also unable to find of any great value.

KEY TO SPECIES

1. Pronotum more or less densely and coarsely punctured, generally with seta near middle of side margin; epipleura, meso- and metapleura and sides of basal segments of abdomen coarsely punctured 2
- Pronotum generally rugose and with a limited number of punctures at most, the lateral seta present in a few cases though generally absent 5

2. Prothorax small as compared with afterbody, with rather narrow and but slightly reflexed side margins especially in front; elytra about a third longer than broad 3
 Prothorax large as compared with afterbody, but little narrower than elytra, and with side margins wide and considerably reflexed 4
3. Reflexed side margins of pronotum thickened, but little more than a marginal bead in front and but little wider behind, the infolded bead extending backwards well beyond middle; elytral punctures large and deep, the intervals well elevated and markedly crenulated, the general surface somewhat reticulate *snowi*
 Reflexed side margins of pronotum more than a bead in front and quite broad posteriorly, the infolded bead hardly extending posteriorly behind middle; elytral punctures somewhat shallow, generally confined to striae and producing but a slight crenulation of intervals, the latter also but moderately elevated *roeschkei*
4. Reflexed side margins of pronotum fully as wide in front as behind, front margin deeply emarginate as result of marked forward extension of front angles; elytra one third longer than broad, striae distinctly impressed with punctures large and deep, the intervals sharply outlined, crenulate and often transversely united *kelloggi*
 Reflexed side margins of pronotum wider behind than in front, front margin but moderately emarginate, the front angles broadly rounded; elytra proportionally broader, never a third longer than broad, discal sculpturing variable. *vandykei*
5. Pronotum punctured if at all only posteriorly, reflexed side margins or wings variable as to size; elytra either with striae and intervals moderately well defined and striae punctures rather fine or the intervals and striae somewhat obliterated, epipleura discretely punctured; fourth antennal segment always more or less pubescent, at least towards apex; male front tarsi very broad, the second broader than long 6
 Pronotum either dull and finely or coarsely rugose, not distinctly punctured, or smooth with coarse punctures limited to depressions, reflexed side margins wide throughout; elytra with continuous and sharply defined striae and intervals, the striae punctures close together, the lateral margin

- at humeri very broadly reflexed, epipleura densely punctured and rugose; fourth antennal segment glabrous like preceding segments; male front tarsi less broad, segments never broader than long 13
6. Basal portion of pronotum with a limited number of punctures, sometimes vague; fourth antennal segment sparsely pubescent towards apex; violaceous or metallic species 7
- Pronotum sericeous, with punctures absent or but obscurely defined; fourth antennal segment entirely glabrous like preceding segments; black species or with but a faint violaceous tint 10
7. Elytral striae and intervals well defined and quite regular, strial punctures rather fine and confined to striae; smaller, more elongate species with prothorax much narrower than elytra, the reflexed side margins narrow; elytra about one third longer than broad 8
- Elytral striae vague, punctures large and well spaced, intervals but little elevated if at all, the disk therefore more or less even; more robust species with the prothorax not much narrower than elytra, the reflexed side margins broad and elytra less than a third longer than broad 9
8. Apex of pronotum feebly emarginate, reflexed side margins narrow in front, but little more than a beading, gradually wider posteriorly and with seta near middle of margin, front angles narrow and close to emargination, hind angles acute and projecting back of base to a moderate degree; elytral intervals sharply defined, rather regular except for an occasional transverse connection and striae rather deep with fine strial punctures which hardly indent the intervals *grahami*, n. sp.
- Apex of pronotum shallowly emarginate, reflexed side margin moderately wide, almost as broad in front as at middle, front angles broadly rounded, the lateral seta generally absent, hind angles blunt or rounded at apices and projecting back of base to but a slight degree; elytral striae distinct but shallowly impressed and with punctures rather large, indenting the intervals so that they are crenulated as well as sinuous *petersi* var. *catalinae*
9. Apex of pronotum deeply emarginate, reflexed side margins broad and markedly elevated, fully as wide in front as one fourth width of disk and as wide in front as at middle, marginal seta generally absent; elytra with prominently

- reflexed margin at humeral angle, striae vague or absent and strial punctures large and well spaced; epipleura and sides of basal abdominal segments coarsely, deeply punctured *petersi*
- Apex of pronotum shallowly emarginate, reflexed side margin in front much less than one fourth width of disk, gradually wider from apex to base, without marginal seta; elytra with but moderately reflexed margin at humeral angle, striae poorly defined and strial punctures moderate in size and shallowly impressed; epipleura shallowly punctured and rugose *biedermanni*
10. Elytral striae, intervals and strial punctures always distinct; hind angles of prothorax blunt and rounded, extending to but a moderate degree beyond base 11
- Entire upper surface more or less smooth; the elytral striae obliterated but the strial punctures very fine and regularly impressed; hind angles of prothorax acute and projecting considerably behind base 12
11. Elytral striae always distinctly impressed, with punctures to a great extent confined to striae, indenting the convex intervals but feebly; reflexed side margins of pronotum not twice as wide posteriorly as in front *mexicanus*
- Elytral striae feebly impressed, the punctures rather large and distinctly indenting the hardly elevated intervals; reflexed side margins of pronotum about twice as wide behind as in front *corvus*
12. Hind angles of prothorax extending one third the length of prothorax beyond its base; elytra one third longer than broad, quite smooth above, with obsolete striae yet with strial punctures observable though minute; general surface above with a violaceous gloss *macrogonus*
- Hind angles of prothorax extending one third the length of prothorax beyond its base; elytra one fifth longer than broad, with striae faintly indicated and strial punctures distinct though fine; general surface above a coal black.
- horni**, n. sp.
13. Pronotum finely or coarsely rugose, punctuation at most shallow and vague, breadth rarely less than two thirds breadth of elytra, the posterior area of hind angles, flat, not sulcate; species averaging 25 mm. in length and with elytra violet or cupreous *elevatus*
- Pronotum with disk somewhat smooth but coarsely punctured

apically and basally and on reflexed sides, breadth generally less than two thirds breadth of elytra, the posterior area of hind angles with a broad and distinct sulcus parallel to hind margin; species averaging 3 cm. in length and with entire upper surface a deep violet or black with a feebly violet gloss *unicolor*

Scaphinotus snowi (Le Conte)

(Plate IV, fig. 4)

Cychnus (*Scaphinotus*) *snowi* Lec., Trans. Kansas Acad. Soc., VII, 74, 1881.

Scaphinotus snowi Roesch., Anns. Mus. Nat. Hung., V, 135, 1907.

Scaphinotus snowi Nicolay and Weiss, Journ. N. Y. Ent. Soc., XLII, 193-195, Pl. XIII, 1934.

Moderate in size, somewhat elongate, black, upper surface a deep violet with elytra often with a cupreous lustre. Head with front smooth except for a few, fine, sparsely placed punctures and minute transverse rugae; antennae with three basal segments and basal half of fourth smooth, the apical half of fourth pubescent as are the following segments. Prothorax about 1 mm. broader than long, apex feebly emarginate, sides evenly arcuate or somewhat straight and convergent posteriorly, the reflexed sides twice as broad in front as the beading, gradually wider posteriorly from the middle, hind angles right angled and in typical specimens projecting about .5 mm. behind base, thus making the base rather deeply emarginate, and generally with a seta near the middle of lateral margin; disk feebly convex, with median longitudinal line sharply impressed and coarsely, rather densely punctured throughout. Elytra more than three tenths longer than broad and three fifths longer than prothorax, oblique laterally at base, sides feebly arcuate at middle, arcuate and narrowed from posterior third to apex, the reflexed margin slightly broader and feebly subangulate at humeri, elsewhere narrow, disk moderately convex, striae well impressed, rather regular within but irregular towards sides, with large, somewhat closely placed and well impressed punctures, the intervals convex, sharply defined, crenulate as the result of the indenting by the strial punctures and transversely united here and there by short cross bars; epipleura coarsely and irregularly punctured and feebly rugose. Beneath smooth

in front, mesoepimeron, metaepisterna and epimera and sides of basal abdominal segments coarsely punctured, abdominal sutures distinct throughout; the hind coxal plates with two posterior setae. Length 16–17 mm., breadth 17–18 mm.

Males with terminal segments of palpi triangularly dilated and spoon-shaped; first three segments of front tarsi dilated and papillose beneath, the first entirely with the exception of short shank, the second feebly transverse.

Holotype male in Le Conte Collection, Mu. Comp. Zoo., Cambridge, Mass., paratype female in Snow Coll., Kansas Univ., both collected by Prof. F. H. Snow in Sante Fé Cañon, N. Mex., alt. 7000 ft., in 1880. Other specimens listed are a series of nine specimens in the Phil. Acad. of Nat. Sci., collected by Dr. H. A. Pilsbury in the Black Range, Sierra Co., N. Mex., 8000–9000 ft. alt.; two others noted by Darlington (see Nicolay and Weiss), one from the vicinity of Durango, La Plata Co., Col., 5500–7000 ft., July 23–Aug. 8, 1885, in Bowditch Coll. of Mu. Comp. Zoo., Cambridge, Mass., and the other from the Blue Mts., La Sal Nat. Pk., Monticello, Utah, collected July 20, 1933, by W. S. Creighton, in Darlington Collection; and a male, figured by Nicolay and Weiss, from Diamond Creek, White Mts., Ariz., collected by D. K. Duncan, July, 1926, in Nicolay Collection. Besides the above, I may mention the following specimens in my own collection now deposited in the Calif. Acad. of Sciences in San Francisco, a series of ten specimens from the type locality, the Sante Fé Cañon, N. Mex., collected by myself, three specimens, a male and two females, July 22, 1926, and seven specimens, three males and four females, June 12, 1935; three specimens from southern N. Mex., two specimens from the original series collected by Dr. Pilsbury, one somewhat injured given to me by Dr. Henry Skinner and one received with the C. W. Leng collection, and the third from the Black Mts., Grant Co., N. Mex., coll. Aug. 11, 1935, by R. T. Kellogg; besides a series of eight specimens from the White Mts. of Ariz., coll. July 10, 1936, by F. H. Parker. I have also examined other specimens from the White Mts. in the collections of F. H. Parker and Owen Bryant. The general distribution of the species is thus shown as western New Mexico, eastern Arizona, southwestern Colorado and southeastern Utah.

This species like its relatives is very variable. I consider that the Sante Fé Cañon specimens should be considered as the most typical. In these the hind angles of the prothorax extend backwards to an appreciable degree beyond the median portion of the base pro-

ducing a definitely emarginate base as mentioned by Le Conte and as indicated in the figure. The hind angles are also definitely angulate apically and the apical margin of prothorax is also rather feebly emarginate. The specimens from southern New Mexico are generally larger, proportionally more elongate and with the apex of prothorax more deeply emarginate and the hind angles blunter apically. The White Mts., Arizona, specimens average about the same size as the Sante Fé Cañon specimens but have the apex of the prothorax more deeply emarginate, the reflexed side margins less broad, more bead like, and the hind angles often less projecting and more rounded at apices. There are in fact two phases or varieties of the beetle from the White Mts., the normal type which approaches very close to the typical form and a second which I am describing as a variety as follows:

Scaphinotus snowi var. *parkeri* Van Dyke, new variety

(Plate V, fig. 9)

Similar in size and general proportions to typical *snowi* but having the prothorax as a whole proportionally smaller and flatter, the anterior margin more deeply emarginate, the reflexed sides but little more than a bead throughout, barely broader behind than in front and the hind angles well rounded and hardly extending at all beyond median basal margin of prothorax so that the basal margin as a whole is almost straight or but feebly emarginate.

Holotype male (No. 4679, Mus. C. A. S. Ent.) and two male paratypes, collected in the White Mts. of Arizona, by F. H. Parker, the first July 7, 1933, the others July 10, 1933. The two latter were taken in company with numerous more typical specimens.

This variety contrasts quite strongly with the usual forms. Whether it is a more alpine phase I cannot say. The male figured by Nicolay and Weiss is of this variety. In one of my paratypes there are two well developed setae near the middle of each side margin and in my holotype, two on the left side only and in the other paratype, two on the right side only. In a specimen of the more typical phase, there are at least four short setae on each side. This seems to indicate that the lateral setae are of less value in defining species than claimed by some, also that the multiple setae seem to suggest a more definite relationship with the subgenus *Nomaretus* where this multiple condition is most evident and likewise claimed by certain students to be of fundamental importance.

Scaphinotus roeschkei Van Dyke

(Plate V, fig. 12)

Scaphinotus roeschkei Van Dyke, Anns. Mus. Nat. Hung., V, 135-136, 1907.

Somewhat smaller in general than the preceding and with the upper surface a deep violet color. Head with front showing a few minute transverse rugae and a number of small punctures; antennae with three and a half basal segments smooth. Prothorax about .5 mm. broader than long, apex slightly emarginate, sides evenly arcuate in front, almost straight and somewhat convergent behind, the reflexed side margins twice as wide in front as beading and gradually wider from apex to base, front angles broadly rounded and somewhat projecting in front, hind angles slightly acute and extending backwards about .5 mm. beyond base, lateral setae present or absent; disk feebly convex, the median longitudinal impressed line distinct, the general surface alutaceous and subopaque and with rather large though shallow punctures, rather densely and irregularly distributed over entire area. Elytra somewhat elliptical, slightly over a third longer than broad and about two and a half times length of prothorax, oblique at base laterally, sides arcuate and gradually narrowed towards apex, reflexed margin quite wide at humeri but narrow elsewhere; disk moderately convex, striae distinctly though shallowly impressed and with punctures of moderate size, well but not deeply impressed, mostly confined to striae and but slightly indenting the convex intervals which are in general quite regular; epipleura coarsely and irregularly punctured. Beneath smooth in front, mesoepimeron and episterna and sides of basal abdominal segments coarsely punctured, abdominal sutures distinct throughout, hind coxal plates with two posterior setae. Length 13-14 mm., breadth 5.5-6 mm.

Males with terminal segments of palpi dilated as in *snowi*, three basal segments of front tarsi dilated and papillose beneath except for the short shank, the second about as broad as long.

Holotype male collected by Prof. F. H. Snow from Humphrey's Peak (25 miles S. W. of Flagstaff), Arizona, at 9500 ft. alt. in August. This specimen was kindly given to me by Prof. Snow, later loaned to Dr. Roeschke of Berlin, where it now is. A paratype male and female collected at the same time and place are now in the Snow Collection at the University of Kansas. I also have in my collection

a series of eight specimens, four males and four females from San Francisco Peak, Ariz., one collected in July, 1910, by Wm. Mann, the others collected June 4, 1935, by myself.

This species is as indicated a species restricted to the high mountains of northern Arizona. It is quite closely related to *snowi*, having the same general shape though with the prothorax as a rule proportionally smaller, the apex of pronotum more deeply emarginate, the reflexed side margins more abruptly elevated and in general broader, at least from the middle backwards, the front angles more prominent, the hind angles more acute and projecting, the disk more shining and with punctures shallower, and the elytra with the striae punctures less coarse and deeply impressed and the intervals much less elevated.

Scaphinotus kelloggi (Dury)

(Plate IV, fig. 3)

Cychrus kelloggi Dury, Journ. Cincinn. Soc. Nat. Hist., XXI, p. 104, 1912.

Moderate in size, somewhat elongate and parallel sided, black with upper surface a deep violet color. Head minutely alutaceous under high magnification, with a few scattered punctures and fine rugae, antennae with three basal segments and basal half of fourth smooth, the apical half of fourth and following segments pubescent. Prothorax only .5 mm. broader than long, broadest in front of middle, apex deeply emarginate, sides broadly arcuate in front, oblique and convergent behind, the reflexed side margins very broad, at least 1 mm. wide in front and behind and but little less at middle, front angles subangulate, extending 1 mm. forward beyond apex of pronotum, hind angles acute and projecting well beyond base, median marginal setae rarely present; disk feebly convex, with medial longitudinal linear impression sharply defined, the general surface shining, alutaceous under magnification, and coarsely, irregularly and more or less closely punctured throughout, the punctures extending on to the reflexed margins as far as the marginal beading, and with well marked, transverse impressions near apex and in front of base. Elytra three-elevenths longer than broad and over twice as long as prothorax, feebly oblique at base laterally, humeral angles obtuse, sides moderately arcuate, reflexed side margins broad and much reflexed at humeri, elsewhere narrow; disk slightly convex, striae shallowly impressed

but striae punctures coarse, well impressed yet irregularly spaced and more or less irregularly arranged towards apex and sides, the intervals well defined but feebly convex and distinctly crenulated as a result of the indenting by the punctures; epipleura coarsely punctured. Beneath smooth in front, mesoepimeron, metaepisterna and sides of basal segments of abdomen coarsely and rather sparsely punctured. Length 16 mm., breadth 7.5 mm.

Males with terminal palpal segments irregularly dilated and spoon shaped; first three front tarsal segments broadly dilated and papillose beneath, the first completely papillose beneath except for short shank, the second segment appreciably transverse.

Holotype collected by R. T. Kellogg in Box Cañon, upper Gila River, New Mexico, in the Charles Dury Collection, now in the possession of his son in Cincinnati, Ohio. Fourteen specimens are now in my collection: two paratypes collected in Grant Co., New Mexico, July 4, 1915, by R. T. Kellogg, one of which was received from Charles Dury and the other obtained with the Charles Leng collection; the other specimens collected in Grant Co., New Mexico, July 4, 1933, Aug. 8, 1935, and other dates, by R. T. Kellogg, and received from him. Numerous other specimens are also known to have been collected and distributed by Mr. Kellogg.

This very elegant and distinct species can always be readily recognized by the fact that the pronotum is much broader in front of the middle and the rather broad reflexed sides as broad in front as behind. The coarsely, densely punctured pronotum associates it with the two preceding species. It is apparently quite restricted in distribution, being found in the mountains of southwestern New Mexico, in Grant Co., and other places in the neighborhood of Silver City. I believe that R. T. Kellogg is the only person who has collected it.

Scaphinotus vandykei Roeschke

Scaphinotus vandykei Roesch., Anns. Mus. Nat. Hung., V, 136-137, 1907.

Somewhat small, rather broad and robust, black with the upper surface a brilliant violet. Head with minute transverse rugae, antennae with three basal segments and basal half of fourth smooth, the apical half of fourth sparsely pubescent, the following densely pubescent as usual. Prothorax in general about .5 mm. broader than long, slightly broader just in front

of middle, apex quite evidently emarginate, sides arcuate in front, oblique and moderately convergent behind, the reflexed sides rather broad, close to 1 mm. in width, gradually wider behind the middle and considerably reflexed, with marginal setae generally present, front angles well rounded and extending well forward, hind angles acute and projecting backwards at least 1 mm. beyond base; disk feebly convex, with median longitudinal linear impression fairly well marked, surface densely, coarsely yet shallowly punctured throughout with punctures on margins vague, and with moderately well defined subapical and subbasal transverse impressions. Elytra at least 1.5 mm. longer than broad and about twice as long as prothorax, with basal margin quite transverse, humeral angles rounded, sides feebly arcuate, reflexed lateral margin broad at humeri, narrow posteriorly; disk moderately convex, striae well impressed and in general separated from each other by intervals of their own width which are rather convex, sharply outlined, crenulate as the result of being indented by the strial punctures, and also transversely united here and there, the strial arrangement likewise more irregular at sides and apex as usual; epipleura coarsely, deeply punctured. Beneath smooth in front, mesoepimeron, metaepisterna and epimeron and sides of basal segments of abdomen generally more or less coarsely punctured, abdominal sutures distinct throughout; posterior coxal plates with two posterior setae. Length 15-16 mm., breadth 6.5-7.5 mm.

Males with terminal segments of palpi irregularly dilated and spoon shaped; the three basal segments of front tarsi broadly dilated and papillose beneath, the first completely papillose beneath except for short shank, the second segment definitely transverse.

The holotype collected by Prof. F. H. Snow on the headwaters of the Santa Maria River, in Arizona, in October, is in the collection of Dr. Roeschke in Berlin. Other specimens in Dr. Roeschke's collection were also collected by Prof. Snow but from Oak Creek Cañon (south of Flagstaff), Arizona, at 6000 ft. alt., during August. I have the following series of twenty-eight specimens: one from the Monte Christo Mine, near Phoenix, July 8, 1909; five from near Phoenix, May, 1910; three from Groom Creek, Yavapai Co., 8000 ft., June 9, 1910, and one from Granite Creek, Yavapai Co., June 10, 1910, all collected by J. August Kusehe; besides two from south-

ern Arizona collected in Aug., 1902, by Prof. F. H. Snow, four from Oak Creek Cañon, Sept. 12, 1933, ten from the same locality, collected June 3, 1935, by myself, and one from Payson, Ariz., collected by D. K. Duncan. Numerous other specimens are in the collections of various entomologists throughout the country.

The species is a very variable one, differing not only as to size but especially as to the width of the reflexed sides of the pronotum and the degree to which these are reflexed or elevated. It is readily separated from the species discussed previously by the proportionately greater width of elytra and the widely reflexed sides or wings of the pronotum. From *petersi* it differs primarily by having the pronotum rather uniformly punctured, the punctuation in *petersi* being either sparse or irregularly disposed. The elytral striae are also very definitely impressed in *vandykei* while vague in *petersi*. The species *vandykei* seems to be confined to southern Coconino and Yavapai counties in Arizona, being found both on the mountains and along the margins of the cold water streams coming from them. A form of this species described by Roeschke as a distinct species, I am considering as but a variety. It is the following:

Scaphinotus vandykei var. *fuchsi* Roeschke

Scaphinotus fuchsi Roesch., Anns. Mus. Nat. Hung., V, p. 570, 1907.

This variety, for a considerable number of specimens proves that it is such and not a subspecies, has all the important characters of *vandykei* and only differs by possessing a pronotum with the side margins less reflexed or much more depressed, thus making the prothorax as a whole much broader, little narrower in fact than the elytra, whereas in typical *vandykei* it is considerably narrower. In *fuchsi* the hind angles of the prothorax are also less acute and extend backwards a shorter distance than they do in *vandykei*, and the elytral striae are in general less well impressed, in this regard suggesting *petersi*. Specimens of *fuchsi* have always been taken in company with typical *vandykei*.

The holotype of *fuchsi* was collected near the Mt. Union Cash Mine, Arizona, on Sept. 12, 1907, presented to Dr. Roeschke by Charles Fuchs of San Francisco and is now in the collection of Dr. Roeschke in Berlin. Presumably the specimen was collected by J. August Kusche. I have in my own collection thirty-five specimens of this variety, collected near the Cash Mine, Crown King, Groom Creek, and other places in the mountains near Prescott, Arizona, all by J. August Kusche. Mr. Kusche widely distributed his material so that this variety is now represented in many collections.

Scaphinotus grahami Van Dyke, n. sp.

Rather small, and delicate, somewhat narrow and elongate, black with the upper surface a very deep violet, almost black in poor light. Head smooth, with a few minute punctures, antennae with three basal segments and basal half of fourth smooth. Prothorax barely broader than long, apex feebly emarginate, sides moderately arcuate in front, oblique and slightly convergent behind, the reflexed sides about twice as broad in front as the beading, gradually wider posteriorly until behind the middle then more abruptly wider, front angles narrow and close to apical margin, hind angles acute and extending backwards to a slight degree, a seta near middle of lateral margin; disk slightly convex, with median longitudinal linear impression distinct, the subapical and subbasal transverse impressions well marked, the general surface finely rugose with a few punctures scattered over the basal half and behind the apical margin. Elytra somewhat elliptical, about three-tenths longer than broad and two and a half times as long as prothorax, oblique at base laterally, sides rounded at humeri, moderately arcuate at middle, the reflexed margin rather broad at humeri, elsewhere narrow; disk slightly convex, striae rather deeply impressed with the punctures fine, somewhat more than their own width apart and confined to striae, hardly indenting the intervals which are quite regular, convex and transversely united here and there by transverse bars; epipleura irregularly and not deeply punctured. Beneath smooth in front, mesoepimeron, mesoepisternum and metaepimeron and sides of basal segments of abdomen sparsely punctured, abdominal sutures distinct throughout; hind coxal plates with two posterior setae. Length 16 mm., breadth 7 mm.

Males with terminal segments of palpi irregularly dilated and spoon shaped; first three segments of anterior tarsi dilated and papillose beneath, the first entirely so with exception of shank, the second segment transverse.

Holotype male (No. 4680, Mus. C. A. S. Ent.), collected by F. H. Parker on Graham Mt., Arizona, July 25, 1933. I have also studied three similar paratypes, collected by Owen Bryant on Graham Mt., Arizona, one on Aug. 12, the others on Aug. 16, 1933.

This attractive species differs from its fellows by its much finer punctuation, both above and below. It most closely simulates *catalinae* but its strial punctures are always finer and the elytral inter-

vals more regular and less crenulated as a result. It seems to be confined to the Pinaleño Mts., an isolated mountain mass.

Scaphinotus petersi Roeschke

(Plate V, fig. 7)

Scaphinotus petersi Roesch., Anns. Mus. Nat. Hung., V, 137-138, 1907.

Moderate in size, robust, broad and much flattened, black with entire upper surface a deep violet color, and shining. Head shining with a few weak transverse rugae back of eyes; antennae with three basal segments and base of fourth smooth, the apical area of fourth sparsely pubescent. Prothorax barely broader than long, apex quite deeply emarginate, sides arcuate to middle thence straight or feebly sinuate and convergent posteriorly, the setae near middle of side margin generally absent, front angles broadly rounded and projecting well forward in front of apex, basal angles broad, acute at apex and extending over one mm. behind base, the reflexed lateral margin about 1 mm. wide in front, widening rapidly behind middle and obliquely elevated; disk moderately convex with median longitudinal linear impression sharply defined, the general surface smooth or minutely alutaceous with a limited number of punctures at base or extending forwards in the lateral depressions, subapically and sometimes obscurely indicated on the reflexed sides, the subapical and subbasal transverse impressions distinct. Elytra three-elevenths longer than broad and about twice as long as prothorax, almost transverse at base, with sides feebly arcuate medially, more broadly so and convergent posteriorly, the reflexed margin broad at the obtusely rounded humeri where about 1 mm. wide, gradually narrowed to middle and from there narrow to apex; disk moderately convex, striae feebly impressed or more often obscure, the strial punctures, however, coarse, well impressed and well spaced, the intervals feebly convex or generally flattened and not well outlined; epipleura coarsely, irregularly punctured and somewhat rugose. Beneath smooth in front but with coarse punctures on mesoepimera, metaepisternum and epimera and sides of basal segment of abdomen, abdominal sutures distinct throughout, hind coxal plates with two posterior setae. Length 18-20 mm., breadth 8-9.5 mm.

Males with terminal palpal segments broadly irregularly dilated and spoon shaped as usual; the three basal segments of

anterior tarsi dilated and papillose beneath, the first with shank and margins towards base smooth, the second barely transverse.

The holotype male of this species, now in the collection of Dr. Roeschke at Berlin, was collected by Dr. E. D. Peters, a companion of H. F. Wickham, in the Pinal Mts. of Arizona, during 1890 and by the latter transmitted to Dr. Roeschke. Four or five other specimens were also taken at the same time, most of which are now, no doubt, in the Wickham collection at the U. S. National Museum. Since this time other specimens have been collected by various workers. I have in my own collection several typical specimens from the Pinal Mts., collected, six on June 18, 1934, and one on Aug. 20, 1933, by F. H. Parker. I also have a specimen from the Sierra Ancha Mts., Ariz., collected in August by D. K. Duncan which is of this species though having the pronotum more generally punctured and the elytral striae distinctly defined. In the Santa Catalina Mts., large numbers of specimens have also been taken. I have five specimens from a large series collected at Soldiers Camp near the top of Mt. Lemmon, 7700 ft. alt., Aug. 18, 1934, by Ian Moore and the California Academy has two specimens collected by J. R. Slevin, one from Marshall's Gulch, the other from the summit of Mt. Lemmon, June 6, 1912. A series of sixty-six specimens collected by M. A. Cazier and an almost equal number collected by E. S. Ross, on July 1, 1936, from near the summit of Mt. Lemmon, have been loaned to me for study purposes. As a result of studying this large number of specimens, I find that there is a very great deal of variation within the species, not only as to size and general proportions which is great, but as to proportionate breadth of prothorax, width and degree of reflexion of side margin of prothorax, denseness of pronotal punctation and degree of impression of the elytral striae and prominence of elytral intervals. The large series collected by Cazier and Ross within a few acres of territory, shows all of the above-mentioned variations and brings out the fact that there are in general two quite contrasting assemblages of forms, one series of which includes what might be called more or less typical *petersi* as described above, specimens of considerable breadth with the sides of pronotum wide and much reflexed, quite flattened elytra with the striae feebly impressed at most but with the strial punctures conspicuous; the other series comprising somewhat depauperized specimens such as I described some years ago as *catalinae*, which are in general narrower and proportionally more elongate than *petersi*, with prothorax proportionally narrower, the side margins narrower and less reflexed, the hind

angles less acute and shorter and the elytra more elliptical, the striae better impressed, strial punctures finer and the intervals more regular. These two forms I was at first inclined to consider as distinct species but the large series mentioned above shows that they intergrade in every imaginable manner. There are specimens with the typical *petersi* afterbody and *catalinae* forebody as well as specimens intermediate in regard to all features. A large series of specimens with the genitalia dissected out of both males and females shows that these organs though variable as to minor details are of essentially the same type in the two forms. The typical *petersi* seems to be distributed throughout the mountains of southwestern Gila County and extends south into eastern Pinal and northeastern Pima County. It is the broadest, most flattened and generally most robust of our southwestern species. The variety *catalinae* as I am now considering it is, however, so distinct when of the extreme form, that I am going to redescribe it in order to have it contrasted with the more typical *petersi*.

Scaphinotus petersi var. *catalinae* Van Dyke

(Plate V, fig. 13)

Scaphinotus catalinae Van Dyke, Pan-Pacific Entom., I, 2,
1924.

Rather small, more or less elongate, black with the usual violet color above. Antennae with the three basal segments and basal half of fourth smooth, the apex of fourth sparsely pubescent. Prothorax at least .5 mm. broader than long, apex feebly emarginate, reflexed sides narrow in front, gradually wider behind middle, but slightly reflexed or elevated with front angles well rounded but close to apical margin and hardly projecting beyond it, the hind angles triangular, acute at apex and extending backwards not more than .5 mm. beyond basal margin, the marginal setae rarely present; disk with punctures sparse and generally confined to basal area. Elytra somewhat elliptical, reflexed margin rather wide at humeri but narrow elsewhere; disk slightly convex, with striae distinctly impressed, strial punctures fine, not deep, intervals well elevated and convex, more or less regular and but feebly indented by strial punctures; epipleura coarsely punctured. Beneath as in *petersi* and male tarsal characters likewise similar. Length 15-18 mm., breadth 6.5-8 mm.

The above description was drawn from one of the original paratypes which comprised a series of more or less uniform small specimens. In this series there were ten specimens collected June 9-10, 1912, by J. K. Slevin, from near the top of Mt. Lemmon, Santa Catalina Mts., Ariz. The California Academy of Sciences also has a series of seventeen specimens from the same locality, collected July 26, 1924, by J. O. Martin, which are quite uniform with the type series. In the lot collected by Cazier and Ross, the series of this variety is large, fifty or sixty in number, but it is not uniform as to character. The specimens are generally larger than are those mentioned before and a large number are intermediate in structural details between typical *catalinae* and typical *petersi* as mentioned previously. The variety *catalinae*, I am inclined to consider as but a depauperized phase of *petersi* which is to be found only on the higher levels of the Santa Catalina Mountains of Arizona. The Slevin and Martin specimens were all collected high up near the top of Mt. Lemmon, and as stated are all rather small and of quite a uniform type. The Cazier, Martin and Moore specimens were collected near Soldiers Camp and other localities at a lower level, at an altitude which, I am inclined to believe, was the maximum for typical *petersi* so that high altitude influences were already beginning to have their effect in producing the more alpine, depauperized, phases.

The specimens of *catalinae* that are most typical are as stated, quite distinct from *petersi* and much more like specimens of *snowi* and *roeschkei*. They differ from these latter, however, by not having the disk of the pronotum uniformly, rather densely punctured, but with the punctures sparser and to a great extent confined to the basal area.

Scaphinotus biedermanni Roeschke

Scaphinotus biedermanni Roesch., Anns. Mus. Nat. Hung., V, 571-572, 1907.

This species collected in the Huachuca Mts. of southern Arizona was supposed to differ from *petersi* in having the sutures at the sides of the abdominal segments somewhat obliterated. In all other essential regards it was much like *petersi*. The description was based upon two males received from Biederman. I have in my own collection a female, likewise received from Biederman and from the same locality from whence the males came. I have critically compared this with numbers of *petersi* and cannot see any great differences; the abdominal sutures seem to be distinct in all. Other characters which were used to separate them, supplementing the above, are

such as are very variable. In the large series of *petersi* which I have had the opportunity to study this variability is distinctly brought out. As far as I know, no specimens of *biedermanni* have been collected in recent years. As indicated above, I am inclined to consider this as nothing more than a weak variety of *petersi*, but I believe that until more examples can be secured to finally settle its status, it should be allowed to stand as a species.

Scaphinotus mexicanus (Bates)

(Plate IV, fig. 5)

Cychnus mexicanus Bates, Anns. Mag. Nat. Hist., IX, 320, 1882.

Cychnus mexicanus Bates, Biol. Cent. Amer., Ins. Col., I Pt. 1, Suppl. 263, t XIII, f. 16, 1884.

Moderate in size, somewhat elongate, black with at times a faint violaceous color. Head smooth, front feebly transversely wrinkled, antennae with three basal segments smooth, the fourth pubescent but to a lesser degree than the following segments. Prothorax barely broader than long, apex slightly emarginate, sides moderately arcuate in front, straight and feebly convergent behind, the reflexed sides somewhat more than .5 mm. wide in front, gradually wider behind, quite obtusely elevated, front angles sharply rounded and close to apical margin, hind angles broadly angulate with apex somewhat acute and extending back almost 1 mm. beyond basal margin, the median longitudinal linear impression fine and but feebly impressed, the subapical and subbasal transverse impressions well marked, the general surface finely alutaceous and somewhat opaque, finely transversely rugose medially and impunctate. Elytra somewhat elliptical, one-third longer than broad, one-sixth longer than prothorax, almost transverse at base, sides moderately arcuate from humeri to beyond middle thence more evidently arcuate and convergent, reflexed margins rather wide at humeri but narrow elsewhere; disk moderately convex, striae well impressed with strial punctures fine, rather close together and confined to striae, the intervals convex, regular except at sides and apex and but feebly indented by punctures; epipleura coarsely, shallowly punctured. Beneath smooth in front, sides of abdominal sclerites with a few scattered punctures, the sutures at sides somewhat connate, hind coxal plates with two posterior setae. Length 19 mm., breadth 8 mm.

Males with the usual dilated and spoon shaped terminal segments of palpi; front tarsi broadly dilated and papillose beneath, the first segment entirely papillose beneath except for short shank, second segment broadly transverse.

Holotype in the Bates Collection, now in the possession of R. Oberthür at Rennes, France. It was collected at Milpas, Ciudad, in Durango, alt. 5900 ft. (Forrer). Other specimens are in the British Museum. I have in my own collection the following: one specimen, somewhat injured, collected by O. T. Baron in Mexico, many years ago and given to me by J. J. Rivers; and a series of twenty-two specimens, several immature, collected by M. A. Embury and Albert R. Mead, at Juan Manuel, El Salto, Durango, Mex., at an altitude of 9000 ft., June 15, 1937.

Scaphinotus corvus (Fall)

Cychnus corvus Fall, Tr. Am. Ent. Soc., XXXVI, No. 2, 89-90, 1910.

Of moderate size, elongate, black with a faint violaceous tinge above. Head smooth in front, obscurely transversely rugose behind; antennae with three basal segments glabrous, the fourth pubescent though not as densely so as following segments. Prothorax .5 mm. broader than long, apex rather deeply emarginate, sides arcuate to middle thence straight and moderately convergent posteriorly, the reflexed side margin almost one mm. wide in front and as far as middle, thence rather suddenly wider posteriorly, anterior angles rounded but narrow and extending forward to but a slight degree, hind angles prominent, somewhat acute at apices and projecting from .5-1.5 mm. posteriorly behind base, the median lateral setae often present; disk feebly convex, with well defined but not deeply impressed median longitudinal line, subapical and subbasal transverse impressions distinct, the general surface dull, somewhat sericeous, with obscure and minute transverse rugae, and a limited number of obscure punctures in the sulci at the base of the obtusely reflexed side margins. Elytra subelliptical, three tenths longer than broad, and from two to three times as long as prothorax, depending on specimen, transverse at base, sides slightly arcuate at first and gradually more arcuate and convergent towards apex, the reflexed margin somewhat broad at humeri, gradually narrower to middle thence uniformly narrow to apex; disk

slightly convex, striae feebly impressed but strial punctures moderate in size, placed their own width apart and here and there longitudinally separated from each other by cross bars, the intervals feebly convex, regular near center but often quite confused towards sides; epipleura rather coarsely, irregularly punctured and rugose. Beneath smooth in front, including mesopleura, the metapleura and sides of abdominal segments coarsely to finely punctured, abdominal sutures distinct throughout, the usual two setae on the hind coxal plates behind. Length 16-18 mm., breadth 7-7.5 mm.

Males with terminal segments of palpi strongly triangularly dilated and spoon shaped as usual; the front tarsi strongly dilated and papillose beneath, the first segment entirely so except for short shank, the second segment somewhat transverse.

The type is a male in H. C. Fall's Collection, which was collected in the "Chiricahua Mountains, Arizona. A single male specimen collected and given me by my friend Mr. V. W. Owen of Los Angeles." In my own collection are seven specimens, one male and six females, all collected along Cave Creek, Chiricahua Mts., Cochise Co., Ariz., as follows: the male, Aug. 14, 1927, five females June 21, 1927, and one female June 24, 1927, all by J. August Kusche. Beside these I have studied three more specimens, two males and a female, collected by E. R. Ross, in the Chiricahua Mts., Ariz., July 10, 1936. There is considerable variation observed in the series studied, most of the specimens having the reflexed side margins of the prothorax very obtusely elevated, with hind angles extending less than one mm. behind base of prothorax, and the disk of elytra rather convex and the intervals feebly convex and quite regular. Presumably these are like Fall's type. In my male, the reflexed sides of the prothorax are much more upright and prominent and the hind angles very acute, projecting fully 1.5 mm. behind base of prothorax, while the elytral striae are less deep and regularly impressed. In regard to the prothorax, especially the hind angles, this specimen approaches the Mexican *macrogonus* and *horni*. In my other divergent specimen, a female, the prothorax is much smaller than usual, with reflexed side margins narrower, but little bit more than the lateral beading in front, and the elytra much flattened with the strial punctures more prominent and the cross bars joining the intervals very numerous producing a somewhat reticulate appearance.

This species is rather closely related to *mexicanus*, undoubtedly arising from the same common stock. *Mexicanus* is in general larger, with the elytral striae deeper and more regular, the striae punctures finer and less conspicuous and the intervals more elevated, convex and regular. The extreme degree of plasticity of *corvus* as of most species of *Scaphinotus*, is indicated by the fact that in the Chiricahua Mts. is to be found *Carabus forreri* Bates, not at all distinguishable from the specimens found in the mountains of Durango, Mexico, while *Scaphinotus corvus* of the Chiricahua and *Scaphinotus mexicanus* of Durango, two species undoubtedly having a common origin, and living under somewhat similar conditions with *Carabus forreri*, in both places, have become quite divergent so that they are now easily distinguishable species.

Scaphinotus macrogonus Bates

(Plate V, fig. 11)

Scaphinotus macrogonus Bates, Tr. Ent. Soc. Lond., Pt. II, June, No. IX, 229-230, Pl. XIII, f. 5, 1891.

Scaphinotus macrogonus Roesch., Anns. Mus Nat. Hung., V, 138-139, 1907.

Moderate in size, elongate black or rufopiceous (immature) with the upper surface violaceous. Head smooth with a few vague transverse rugae; antennae with three basal segments glabrous, the fourth fully as pubescent as following. Prothorax including hind angles as long as broad, apex quite deeply emarginate, sides arcuate to middle thence almost straight and feebly convergent to apices of hind angles, the reflexed margins quite upright, rather broad in front, .75 mm. wide, and from middle rather suddenly wider, anterior angles rounded, not broad and projecting but slightly beyond apex, hind angles very prominent and very acute, extending about 2 mm. beyond base, median lateral setae absent; disk flattened, with fine, feebly impressed median longitudinal line, with subapical and subbasal transverse impressions quite well marked, the general surface somewhat dull, alutaceous under magnification, and without punctures. Elytra subelliptical, one fourth longer than broad and twice as long as prothorax, base transverse, sides arcuate, gradually more rounded and convergent towards apex; disk feebly convex, quite flattened towards suture and smooth, the striae obliterated, striae punctures minute but in most cases observable under magnification and serially arranged, intervals not sharply demarked from

the generally smooth surface; epipleura shallowly, rather finely punctured. Beneath generally smooth, even the side pieces of metapleura smooth and but few vague punctures at sides of abdomen, abdominal sutures distinct, the two posterior setae on hind coxal plates present. Length 20 mm., breadth 8 mm.

Males with characters of following species.

The type, collected by Höge, from Refugio in Durango, Mexico, passed with many of the Bates types into the hands of René Oberthür of Rennes, France, and it presumably is still there. In the British Museum there are other specimens collected by Höge at Refugio and a single female specimen of the original series was kindly given to me by the authorities of the British Museum through Dr. K. G. Blair. In this connection it is well to quote Bates as follows: "All the numerous examples of *Scaphinotus*, labelled by Herr Höge with the above locality, are conformable to the diagnosis given above, while all those ticketed 'Ciudad' belong to *S. mexicanus*, in which the hind angles of the thorax are only moderately produced, *i.e.*, not prolonged into a fine point, and the elytra closely and strongly punctate-striate with narrow raised intervals."

This very distinct species may be readily separated from all of its fellows, by its elongate body, smooth and somewhat violaceous upper surface, and very long and acute hind angles to the prothorax. It is most closely related to the following.

***Scaphinotus horni* Van Dyke, n. sp.**

(Plate V, fig. 10)

Medium sized and sooty black throughout, similar in structure to the preceding but shorter and proportionally broader. Head smooth; antennae with but three basal segments glabrous. Prothorax about .5 mm. broader than long, apex slightly emarginate, sides arcuate to middle, thence almost straight and slightly convergent backwards, the reflexed sides very obtusely elevated, about .75 mm. wide in front and rapidly wider behind the middle, front angles rather broadly rounded and slightly extending forwards, hind angles very prominent and very acute at apices, projecting fully 1 mm. beyond base, seta absent from middle of lateral margin; disk flattened with median longitudinal line finely impressed and subapical and subbasal transverse impressions well marked, the general surface opaque, alutaceous under good magnification and without punctures. Elytra cordiform,

three elevenths longer than broad and somewhat more than twice as long as prothorax, basal margin oblique laterally, humeral angle subangulate and rounded and convergent posteriorly, the reflexed margin broad at humeri, narrowed behind and slightly though gradually narrower from basal fourth to apex; disk moderately convex, with striae vaguely impressed and striae punctures fine, rather regularly arranged and about twice their own diameter apart, the intervals and general surface smooth, flat and subopaque; epipleura distinctly though rather shallowly punctured. Beneath generally smooth and impunctate, abdominal sutures distinct throughout and the usual two posterior coxal setae present. Length 17 mm., breadth 8 mm.

Male with last palpal segments broadly dilated and irregularly spoon shaped; the front tarsi broad and papillose beneath, the first completely so except for shank, the second transverse.

Holotype, a unique male in the Kraatz Collection of the Deutsches Entomologische Institut at Berlin-Dahlem, bearing the label "Mexico," kindly referred to me for study and description, by Dr. Walther Horn.

This species is rather closely related to *macrogonus* but somewhat shorter and proportionately broader, with the reflexed sides of pronotum more acutely elevated, the hind angles long and acute but slightly less lengthened and spinose, the striae punctures of elytra more evident, and the general color a sooty black in contrast to the distinctly violaceous color of *macrogonus*. There was some doubt as to the correctness of the locality Mexico, as expressed to me by Dr. Horn, but from its close relationship to *macrogonus*, I believe that it could have come from nowhere else. It is with great pleasure that I name this fine species after my old and dear friend, Dr. Walther Horn.

Scaphinotus elevatus (Fabricius)

Carabus elevatus Fabr., Mant. Ins. I, p. 198, n. 37, 1787.

Carabus elevatus Fabr., The Fabrician Types of Insects, Staig, Cambridge, 13-15, Pl. 6, 1931.

Carabus elevatus Oliv., Entom. III, No. 35. 46, Carabus Pl. VII, f. 82, 1789.

Cychnus elevatus Fabr., Syst. Eleuth. 7, 166, 1801.

Cychnus elevatus Knoch, Neue Beiträge I, 188, t. 8, f. 12, 1801.

Cychnus elevatus Say, Tr. Am. Phil. Soc., II (new series), 7, Pl. 45, f. 4, 1825.

- Reflexed sides much less acutely elevated, rarely as much as 30 degrees; disk rather coarsely irregularly rugose *flammeus*
4. Reflexed sides of prothorax but moderately convergent posteriorly; elytral striae deeply impressed and coarsely, closely punctured *tenebricosus*
- Reflexed sides of prothorax strongly elevated and convergent posteriorly; elytral striae less deeply impressed and more finely punctured, the intervals also less carinate, in general more flattened *lengi*
5. Elytra brilliantly cupreous or cupreous violet as in typical *elevatus*, the intervals very regular but slightly crenulate as result of strial punctures being fine and to a great extent confined to striae *coloradensis*
- Elytra deep violet, almost black, the intervals very sinuous and crenulate, often broken, as the result of the coarse strial punctuation *neomexicanus*

Scaphinotus elevatus (Fabricius), *sensu stricto*

(Plate IV, fig. 2)

Medium size, broad and robust, black, with the epipleura a deep violet, the head and prothorax above dull black or bluish black and the elytra brilliantly cupreous or cupreous violet in color. Head with fine transverse rugae, often faint; antennae with four basal segments glabrous. Prothorax averaging one fourth broader than long, apex with well defined emargination, sides arcuate and diverging to beyond middle then somewhat straight and feebly convergent posteriorly, without marginal setae, the reflexed margin elevated posteriorly at about a 30 degree angle, very broad, generally over 1 mm. wide in front and markedly increasing in width from about the middle to hind margin, the front angles in the form of small, well rounded lobes, close to apex and projecting slightly forward, the hind angles broadly angulate with apices somewhat acute, generally depressed at tip and extending backwards beyond base to the extent of about 1 mm., the hind marginal area always flattened; disk with median longitudinal line finely impressed, the subapical and subbasal transverse impressions shallow yet distinct, the general surface densely, finely, transversely rugose, of a dull black color or obscurely violaceous, the inner surface of wings coarsely, shallowly, irregularly punctured and rugose, and the flattened base rarely more than two thirds as wide as the

hind margin of posterior angles. Elytra about one sixth longer than wide and twice as long as prothorax, somewhat transverse at base, with humeral angles subangulate yet rounded and broadly reflexed, the sides moderately arcuate until near apex then almost straight or feebly sinuate to suture, the reflexed margins narrow behind humeri and gradually narrower towards apex; disk evenly but not strongly convex, punctate-striate, the striae deeply impressed with close set, rather coarse punctures, with as a rule fourteen quite regular intervals besides several irregular ones near margin, which are abruptly elevated, convex and with sides finely crenulate or indented by the strial punctures. Beneath smooth in front, epipleura coarsely, densely punctured and rugose, the meso- and metapleura and sides of first and second ventral segments also somewhat punctured; the hind coxal plates with the usual two posterior setae present. Length 15-23 mm., breadth 10 mm.

Males with the terminal palpal segments broadly, irregularly dilated and spoon shaped and the front tarsi dilated and papillose beneath, the first segment fully two and a half times as long as broad with papillose area, an elongate triangular patch clothing the apical two thirds and leaving the rather long shank naked, the second segment quadrate and distinctly longer than broad.

This the typical and first described form is of course somewhat variable, the variability being shown most in the degree of elevation of the reflexed sides of the prothorax, the degree of convergence of these reflexed margins posteriorly, the sculpturing of the disk of the pronotum, and the color and to a slight extent the sculpturing of the elytra. It is generally found along the Atlantic seaboard ranging from New York to about North Carolina. I have a specimen before me from Lawrence, Kansas (Benedict Coll.) from the Blaisdell Collection which belongs here. The pronotum is a deep violet and the reflexed margins of prothorax are quite markedly elevated and hind angles very acute. Normally, the specimens from this territory would be of the subspecies *flammeus*.

Scaphinotus elevatus flammeus Haldeman

Cychrus flammeus Hald., Proc. Ac. Nat. Sc. Phil., II, 54, 1844.

Cychrus dilatatus Lec., Tr. Am. Phil. Soc., X, 398, 1853.

Scaphinotus flammeus Lec., Ann. Lyc. Nat. Hist., N. Y., IV, 440, 1848.

Scaphinotus elevatus flammeus Roesch., Anns. Mus. Nat. Hung., V, 141, 1907.

Scaphinotus elevatus flammeus Leng, Journ. N. Y. Ent. Soc., XXII, 140-141, 1914.

In this subspecies we have an insect which is generally proportionally broader than the more typical form, with the reflexed margins of the prothorax less acutely elevated so that a cross view gives it the appearance of being much flatter; the disk of the pronotum is also generally more coarsely rugose and the punctuation on the reflexed margins also much coarser and the general surface likewise more rugose.

The Haldeman type was from Marietta, Ohio, on the Ohio River and was described as follows: "Elytra pale brilliant violet, distinguished from *elevatus* by the wide prothorax and elytra and lighter color; profile flatter above when viewed laterally." Because of the stated "pale brilliant violet," Le Conte later on described a specimen from St. Louis, Missouri, as *dilatatus*. These were no doubt but slight variants of the same thing. The lighter color could easily be caused by immaturity. The violet color as contrasted with the generally cupreous color is not of great moment in this species for the color varies considerably. This subspecies ranged from Ohio south to Tennessee and west through Iowa to Nebraska, Kansas, Missouri and Arkansas. The Nebraska and Missouri specimens which are fairly common in collections, are in general in agreement with Le Conte's *dilatatus*. Exceptions do occur, however, as noted previously. The subspecies grades gradually into typical *elevatus* along its eastern boundary and into *coloradensis* along its western boundary. The gradation is noted especially as regards the size of the papillose area of the first segment of the front tarsi of the males. The material that I have studied consists of some twenty-six specimens from Nebraska, Kansas, Missouri and Arkansas.

Scaphinotus elevatus tenebricosus Roeschke

Scaphinotus elevatus tenebricosus Roesch., Anns. Mus. Nat. Hung., V, 141, 1907.

Scaphinotus elevatus tenebrosus auct.

Scaphinotus unicolor Lec. (nec. Fab.), Tr. Am. Phil. Soc. X, 398, 1853.

Scaphinotus heros Lec. (nec. Harris), Ann. Lyc. Nat. Hist., N. Y., 440, 1848.

The specimens of this subspecies differ from the typical *elevatus*, primarily by having the elytra dark, a deep violet, almost black, thus offering very little in the way of a color contrast to the forebody. Other features as judged by my specimens are that the reflexed sides of the pronotum are generally more acutely elevated, the hind angles more convergent; the elytra often proportionately broader, the disk a bit more convex, the intervals generally more carinate and crenulate, the latter produced by the apparently more decidedly impressed striae punctures. There is a great deal of individual variation, though, and specimens even from the same region may vary greatly, particularly as to the character of the reflexed sides of pronotum. In general this subspecies might be considered as but a melanotic race of *elevatus*.

Roeschke did not state from what locality his type specimen came, merely mentioning the fact that the subspecies ranged along the coast from New Jersey to South Carolina. The series of specimens that I have studied consists of fourteen, four from Newport News, Virginia; four from Southern Pines, North Carolina (Manee Coll.); one from Wilkesbarro, Virginia, the others simply labeled "Va." It is apparently confined to the more maritime or coastal portion of the South Atlantic States, replacing almost entirely the typical phase in its area of distribution.

Scaphinotus elevatus lengi Van Dyke, new subspecies.

At first sight and because of its distribution, this subspecies would be placed as but an extreme example of the above. It has the same uniform dark color but is somewhat narrower, has the reflexed sides of pronotum more upright, the hind angles more acute and much more convergent, the pronotal disk more finely, transversely rugose, the hind margin of disk more narrowed, hardly two thirds width of hind margin of hind wings and the elytra slightly flatter, with the striae regular, much more shallowly impressed than usual in the species and the striae punctures fine, close together and practically confined to the striae with the result that the intervals which are not sharply elevated are straight or feebly sinuous, not strongly crenulate as in *tenebricosus* or in fact any of the other subspecies. The punctuation of the epipleura is also less dense than in the latter.

The male has similar palpal characters to the above but the front tarsi are but slightly dilated, the first segment over three times as long as broad, with a long narrow shank so that the papillose area beneath covers but little more than half of the

segment, the second segment is also elongate triangular, not quadrate as in the other subspecies.

Holotype male (No. 4681, Mus. C. A. S. Ent.), a unique, received with the Charles Leng Collection but collected by G. P. Engelhardt in the Dismal Swamp of Virginia, on July 22.

Scaphinotus elevatus coloradensis Van Dyke

(Plate V, fig. 6)

Scaphinotus elevatus coloradensis Van Dyke, Anns. Mus. Nat. Hung., V, 141-142, 1907.

This subspecies is rather closely related to the subspecies *flammeus*, sharing the less strongly reflexed margin, the cupreo-violet elytra, and the general appearance. It is, however, generally smaller, proportionately narrower, the prothorax always much narrower, the reflexed sides in particular, the hind margin of posterior angles barely wider than the base of the disk, the sculpturing of the disk much finer and the strial punctuation of the elytra also much finer. The males have the first segment of the front tarsi much more extensively papillose beneath, the papillose area covering the entire under surface except for a short shank, and the second segment is almost as broad as long whereas in *flammeus* and most of the other subspecies of *elevatus*, the males have the first tarsal segment of the front tarsi papillose beneath for but little more than two thirds of its length and the second segment is decidedly longer than broad. With this subspecies I have included a race from Sioux Co., Nebraska, that differs from the usual *coloradensis* by having the elytra in general of a deep violet color, the strial punctures of the elytra very coarse and the intervals as a result much crenulated and in places quite irregular, and the pronotum rather coarsely rugose.

The original description of *coloradensis* was based upon specimens in the American Museum of Natural History at New York collected in eastern Colorado, and the designated holotype is there. I now have in my own collection six specimens, one collected along Williams Creek near Manitou, Colorado, June 20, 1926, and five collected in Santa Fe Cañon, New Mexico, June 22, 1926, by myself, besides a specimen which came to me with the C. W. Leng Collection with a Julich label on it, from Colorado. This last I am inclined to believe was from the same lot from whence the type specimens came. I have also had the opportunity to study two specimens from the Fenyes Collection, that were collected in Santa Fe Cañon, New

Mexico, as well as a series of sixteen specimens, mentioned above, in the Owen Bryant Collection that were collected by F. H. Shoemaker in Warbonnet Canyon, Sioux Co., Nebraska, June 27, 1911.

Scaphinotus elevatus neomexicanus Van Dyke

Scaphinotus elevatus neomexicanus Van Dyke, Pan-Pacific Ent., I, 1, 1924.

The original description of this subspecies is as follows: "This subspecies differs from the typical *elevatus* by being of a deep violet black color, by being proportionally narrower, the prothorax smaller, less than two-thirds as long at the middle as broad, with a broad somewhat convex and cordate disc, the lateral wings abruptly elevated from the sides, not gradually as in the other, but little arched and with the margin almost equally thickened throughout; the elytra with the margins only moderately explanate in the humeral region and rather narrow elsewhere, the disc broadly convex and quite flattened at the middle, and the striae deep and closely crenulately punctured. When viewed from behind, the contrast in outline between this and the typical form is most marked. Length 19 mm., breadth 8.5 mm."

"Type, female in my collection, collected at Cloudcroft, Sacramento Mountains, New Mexico, altitude 8000 feet, July 5, 1917, by Professor W. M. Wheeler and by him kindly presented to me." The holotype is now in the Entomological Collection of the California Academy of Sciences, San Francisco, where my entire collection is permanently deposited.

This subspecies because of its uniform coloration superficially suggests the subspecies *tenebricosus* but can always be readily separated from that as from all of the unicolorous species by the markedly sinuous and crenulated elytral intervals and the very coarse strial punctuation. The type and only specimen seen is a female, so I cannot give the male characters.

Scaphinotus unicolor (Fabricius)

(Plate IV, fig. 1)

Carabus unicolor Fabr., Mant. Ins., 198, n. 38, 1787.

Carabus unicolor Fabr., Staig. The Fabrician Types of Insects, Cambridge, 16-17, pl. 6, 1931.

Carabus unicolor Oliv., Entom. III, No. 35, 47, pl. 6, f. 62, 1789.

- Cychnus unicolor* Knoch, Neue Beyträge, 187, 5, 8, f. 1, 1801.
- Scaphinotus unicolor* Roesch., Anns. Mus. Nat. Hung. V, 142-143, 1907.
- Scaphinotus unicolor* Leng, Journ. N. Y. Ent. Soc., XXII, No. 2, 141-144, 1914.
- Cychnus heros* Harris, Proc. Boston Soc. N. H., 196-197, 1839.
- Scaphinotus heros* Roesch., Anns. Mus. Nat. Hung., V, 142-143, 1907.
- Scaphinotus unicolor heros* Leng, Journ. N. Y. Ent. Soc., XXII, No. 2, 141-142, 1914.
- Scaphinotus unicolor shoemakeri* Leng, Journ. N. Y. Ent. Soc., XXII, No. 2, 141-142, 1914.
- Scaphinotus elevatus* var. *floridanus* Leng, Bull. Am. Mus. Nat. Hist., XXXIV, 564, 1915.

This splendid species is found on both sides of the Alleghany Mountains, on the east side from the District of Columbia and Maryland to Florida and on the west side in Ohio, Indiana and Missouri. There has been for a long time confusion with regard to it, many of the early workers confusing it with *viduus* Dej. even though Say recognized the difference when he sent a specimen of the latter to DeJean to be described, and with *elevatus* Fabr. In recent years numerous specimens of both have been collected so that a study of these in connection with the original description and those types which still exist has made it possible to clear up the confusion. Roeschke and Leng have been chiefly responsible for this. In a species that is rather widely spread it is not surprising to find that it breaks up into several divergent forms or weak subspecies which are, however, sufficiently different to be recognized. These I will now attempt to define.

KEY TO SUBSPECIES OF *S. UNICOLOR*

1. Rather large, 25 mm. or more in length 2
Somewhat smaller, 21 mm. in length and with reflexed sides of prothorax but slightly elevated.....*floridanus*
2. Unicolorous, shining black or in strong light a very deep violet, the reflexed sides of pronotum strongly elevated so that the transverse diameter of prothorax is very much less than that of the elytra; the latter with margins at middle very feebly sinuate if at all*unicolor*

- Deep violet above, the elytra generally lighter in color and more brilliant than the forebody, the reflexed sides of pronotum generally more obtusely elevated so that the transverse diameter of prothorax is but little narrower than base of elytra3
3. Side margin of elytra behind middle very feebly if at all emarginate and sinuate.....*heros*
- Side margin of elytra behind middle very distinctly emarginate and sinuate.....*shoemakeri*

Scaphinotus unicolor (Fabricius) *sensu stricto*

Large, robust, black and shining above with but the faintest violaceous tint in strong light. Head with front smooth, eyes but moderately convex, first four antennal segments glabrous. Prothorax generally somewhat broader than long, 1 mm. or over, apex rather deeply and abruptly emarginate, apical angles narrow yet well rounded and close to apical margin, sides broadly arcuate and gradually divergent to beyond middle then almost straight or feebly arcuate and slightly convergent posteriorly, the reflexed sides of moderate width in front and much incurved and rather broad behind the middle where also less acutely elevated than in front and much flatter and with beading less pronounced, hind angles broad, subacute but rounded at apices, extending fully 1.5 mm. behind base and with shallow sulcus parallel to and within hind margin; disk feebly convex, more or less smooth, with median longitudinal impression linear and well marked, the subapical and subbasal transverse impressions distinct, and rather strongly, sparsely punctured apically, basally and along the base of the reflexed sides as well as upon the inner face of the sides themselves. Elytra one third longer than broad, transverse at base, with sides moderately arcuate, side margin straight or feebly sinuate back of middle, and gradually convergent and feebly sinuate before apex, the reflexed margin broad at humeri and narrow behind; disk moderately convex, striae regular and well impressed medially, irregular or confused at sides, and with fine, rather closely placed punctures, the intervals slightly broader than striae, feebly crenulate and but moderately convex. Beneath smooth in front; epipleura coarsely, closely punctured and rugose; meso- and metapleura and sides of three basal abdominal segments sparsely and gradually more finely punctured posteriorly, the remainder of abdomen smooth; hind coxal plates

with only one posterior seta. Length 25–28 mm., breadth 12–14 mm.

Males with terminal segments of palpi broadly dilated and spoon shaped as usual; the anterior tarsi elongate and but very little dilated, the first segment about four times as long as broad and with but a small papillose area near apex beneath, hardly more than a fourth of the length of segment, the second segment about twice as long as broad and this as well as the two following segments somewhat cuneate and papillose beneath.

The typical *unicolor* as described above was first described by Fabricius in 1787 from a specimen in the Hunterian Collection at Glasgow. Recently Staig (1931) restudied the type, redescribed and figured it in his work on "The Fabrician Types of Insects." No locality was given for the specimen, but the probabilities are that it came from the South Atlantic States as surmised by Leng. Recently H. P. Löding has collected quite a number of specimens of this species in northern Alabama, which agree in every regard with the original description as well as that given by Staig. These specimens as indicated in my description are unicolorous black with but the faintest violaceous tint in strong light. In Staig's work the illustration is too highly colored. Dr. Staig has informed me, however, that the type itself is not so brightly colored. I am inclined to believe that these black Alabama specimens are typical. In examining a number I also find that there is a good deal of variation, chiefly as regards the degree to which the reflexed margins of the prothorax are elevated; in some where they are more widely separated and flattened, the apices of the hind angles are about 8 mm. apart while in others, the margins are much more abruptly elevated and closer together with the hind angles but 5 mm. apart. In all of these specimens the sides of elytra back of middle are feebly emarginate and sinuate.

Scaphinotus unicolor shoemakeri Leng

Scaphinotus unicolor shoemakeri Leng, Journ. N. Y. Ent. Soc., XXII, 143, fig., 1914.

This very weak subspecies differs primarily from the more typical form by being generally larger; of a decidedly violaceous color with the elytra quite brilliant and contrasting with the darker pronotum, hence somewhat bicolored; and by having the sides of elytra behind the middle more definitely emarginate and sinuate. The reflexed margins of prothorax are also somewhat variable as

to degree of elevation. The type which is now in my collection, deposited in the California Academy of Sciences, and most of the specimens in collections have been collected near Washington, D. C., either on the Maryland or Virginia side of the Potomac River. Other specimens seen which cannot be separated from the above, have been collected at Monte Sano, Madison Co., Alabama, by H. P. Löding, indicating that the subspecies range along the eastern flanks of the Alleghanies for a considerable distance. In Alabama certain specimens also show that it grades gradually into the typical *unicolor*. I consider it but a very weak subspecies at most.

Scaphinotus unicolor heros Harris

Scaphinotus heros Harris, Boston Journ. Nat. Hist., 196-197, 1839.

The type of *heros* Harris which came from Ohio has been lost. From the description, however, I am inclined to agree with Leng (1914) that it is not absolutely identical with *unicolor* but a very weak race or subspecies of the same characterized by having the elytra a pronounced violet color, quite shining, and contrasting with the somewhat duller forebody as does *shoemakeri*, and by having the sides of elytra behind the middle with but the feeblest indication of an emargination or sinuation, in this latter regard approaching the typical *unicolor*. The degree of reflection of the sides of pronotum is so variable among individuals that I consider it of no great value for defining races. All specimens from west of the Alleghanies as from Ohio, Indiana, Kentucky, Tennessee and Missouri might be considered as of this subspecies. It is, however, a very weak one like *shoemakeri*.

Scaphinotus unicolor floridanus Leng

Scaphinotus elevatus var. *floridanus* Leng, Bull. Ann. Mus. Nat. Hist., XXXIV, 564, 1915.

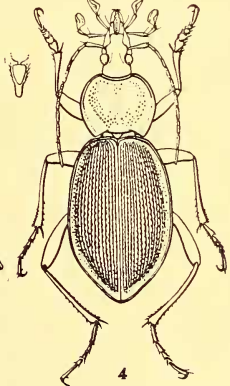
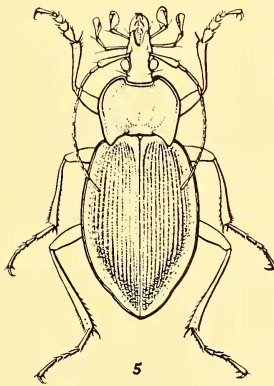
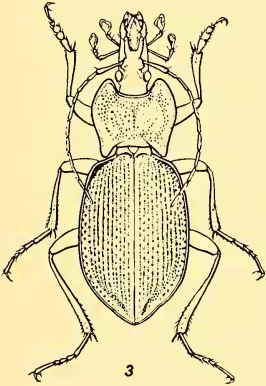
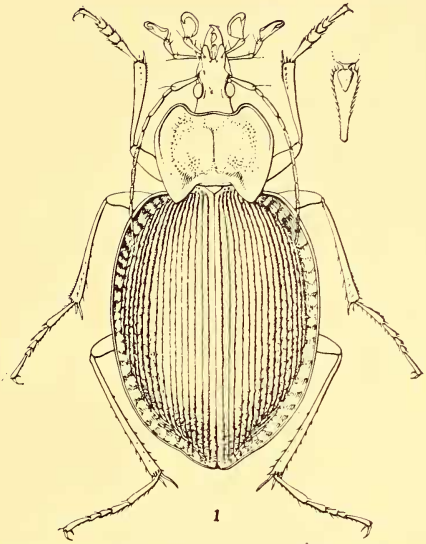
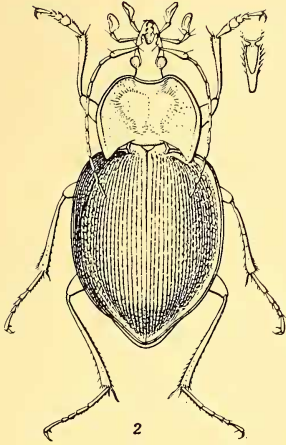
As indicated previously, I consider *floridanus* as but a depauperized variety or subspecies of *unicolor* not a variety of *elevatus* as supposed by Leng. The type is now in my collection, deposited in the California Academy of Sciences. A careful examination shows that the posterior portion of the hind angles of the prothorax has a feeble sulcation parallel to the hind margin, a diagnostic character of *unicolor*, not flattened as in *elevatus*. The pronotal sculpturing and type of male tarsi is also that of *unicolor*, not that of *elevatus*. The characters that separate it from typical *unicolor* are its smaller

size, length 21 mm., the reflexed side margins of prothorax but little elevated and with the beading very much thickened and the discal area strongly punctured at sides. In color it is a very deep violet, almost black and unicolorous, thus in agreement with typical *unicolor*. As stated by Leng, the type of *floridanus* was originally in the Schaupp collection, then passed into the hands of Luetgens and later to Leng and finally to me.

EXPLANATION OF PLATE IV

- Fig. 1. *Scaphinotus unicolor* (Fabr.), with greatly magnified 1st seg. of ♂ front tarsus.
- Fig. 2. *Scaphinotus elevatus* (Fabr.), with greatly magnified 1st seg. of ♂ front tarsus.
- Fig. 3. *Scaphinotus kelloggi* (Dury).
- Fig. 4. *Scaphinotus snowi* (Lec.), with greatly magnified 1st seg. of ♂ front tarsus.
- Fig. 5. *Scaphinotus mexicanus* (Bates).

Figures magnified five times.



EXPLANATION OF PLATE V

- Fig. 6. Body of *Scaphinotus elevatus coloradensis* Van Dyke, with greatly magnified 1st segment of ♂ front tarsus.
- Fig. 7. Body of *Scaphinotus petersi* Roesch.
- Fig. 8. Body of *Scaphinotus biedermanni* Roesch.
- Fig. 9. Body of *Scaphinotus snowi* var. *parkeri* Van Dyke.
- Fig. 10. Body of *Scaphinotus horni* Van Dyke, with greatly magnified 1st seg. of ♂ front tarsus.
- Fig. 11. Body of *Scaphinotus macrogonus* Bates.
- Fig. 12. Prothorax of *Scaphinotus roeschkei* Van Dyke.
- Fig. 13. Prothorax of *Scaphinotus petersi* var. *catalinae* Van Dyke, with greatly magnified 1st segment of ♂ front tarsus.

Figures magnified five times.